

EMULSIFIED-ASPHALT SLURRY SEAL

(Quality Control)



***A
Guide
to
Quality
Construction***



This publication has been produced by the International Slurry Surfacing Association (ISSA) to serve as a tool to assist contractor members and buyer agencies in specifying and recognizing quality construction practices for slurry seal projects. This document is meant to serve as a training and educational tool only, and in no way should the procedures discussed here be viewed as the only definitive solution or procedural method used on slurry seal projects.

As is the case in all construction activities, there are many methods to achieve the desired results. This document has been designed hopefully to point out a method procedure that may assist the contractor and buyer agency in recognizing some of the things that can be done to achieve a successful project.



International Slurry Seal Association
EMULSIFIED ASPHALT SLURRY SEAL
(QUALITY CONTROL)

1200 19th St. N.W., Suite 300, Washington D.C. 20036-2401

Jan. 1997

NOTICE

It is not intended or recommended that these guidelines be used as specifications. They will, hopefully, be an aid in helping buyer agencies establish better specifications. Users should understand that almost all areas vary as to the availability of aggregate and emulsions. Efforts should be made to find out what materials are available and how compatible they are. Feel free to contact the ISSA for answers to any questions and also for a list of ISSA contractors and companies who could assist.

DESCRIPTION

The slurry seal shall consist of a mixture of an approved emulsified asphalt, mineral aggregate, water and specified additives, proportioned, mixed and uniformly spread over a properly prepared surface as directed by the Buyer's Authorized Representative.

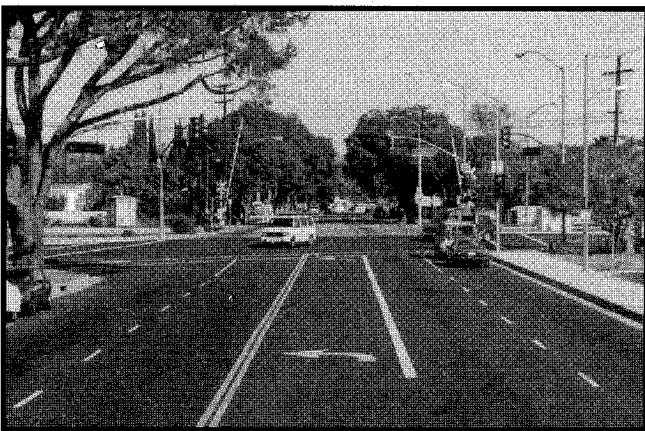
The completed slurry seal shall leave a homogenous mat, adhere firmly to the prepared surface, and have a skid-resistant surface texture throughout its service life.



RESIDENTIAL STREETS

Slurry seal has proven to be an ideal method for maintaining residential streets.

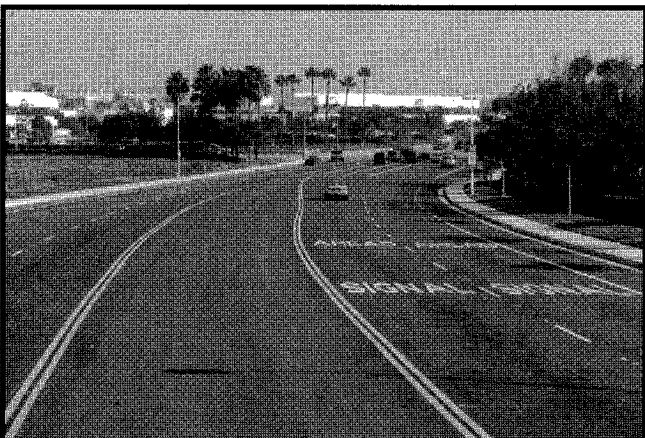
SLIDE 2



COLLECTOR STREETS

Collector streets contiguous to residential areas are well suited for slurry surfacing

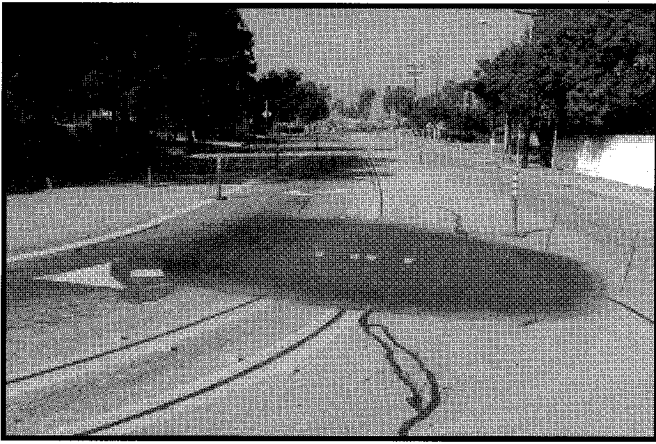
SLIDE 3



ARTERIAL STREETS

Slurry surfacing provides good service for an arterial street carrying heavy truck and automobile traffic.

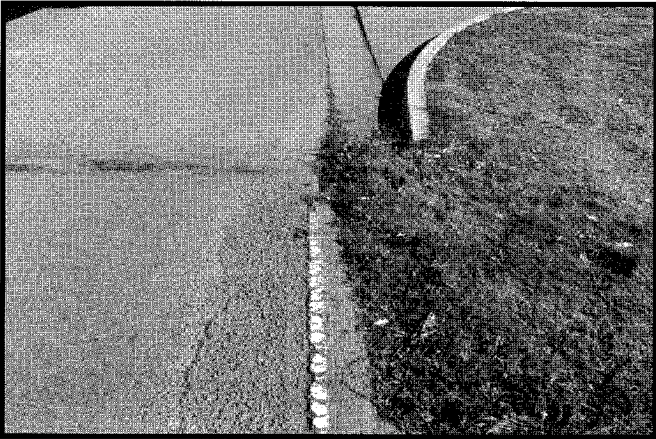
SLIDE 4



PATCHING FAILED PAVED AREA

Streets should be properly patched prior to any slurry applications. Patches should be smooth and level with the adjacent surfaces. Failed or alligatored areas should be removed, and the aggregate base and hot mix surface course replaced.

SLIDE 5



INTRUSION OF GRASS AND WEEDS

Unless proper maintenance procedures are used by owner agency, grass and weeds will intrude into the joint areas between the concrete gutters and the asphalt surfaces.

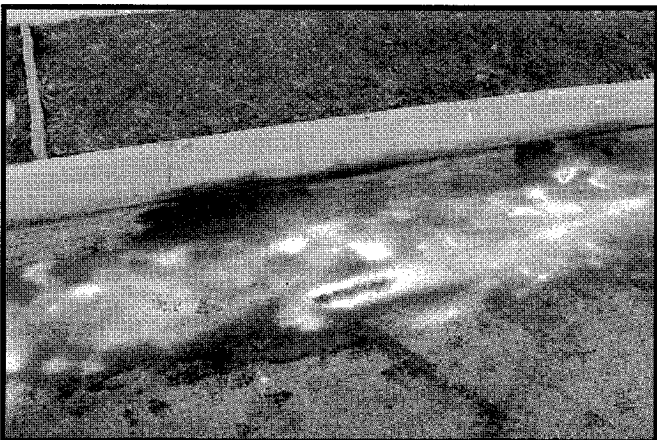
SLIDE 6



TREATMENT AND REMOVAL OF GRASS AND WEEDS

A suitable chemical herbicide should be applied to all incidental vegetation growing in the gutter or paved areas. This should be done several weeks prior to the removal of the vegetation.

SLIDE 7



TREATMENT OF OIL SPOTS

Any areas of accumulated oil and dirt that are raised above the adjacent paved surface should be removed by scraping or grinding. Areas of accumulated oil should be treated with a suitable sealing/bonding agent. Sometimes silica sand is broadcast onto the wet sealing agent to enhance the bond between the treated surface and the slurry.

SLIDE 8

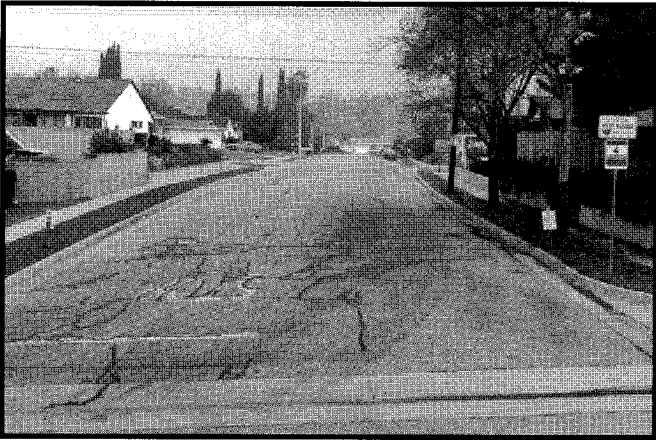


PAVEMENT SURFACE CRACKS

Due to the effects of weathering and underlying soil conditions, surface cracks may develop sometime during the life of the pavement.

Fill cracks in the pavement prior to slurry sealing. A material specifically designed for crack filling should be applied to prevent the intrusion of water into the base and sub-grade.

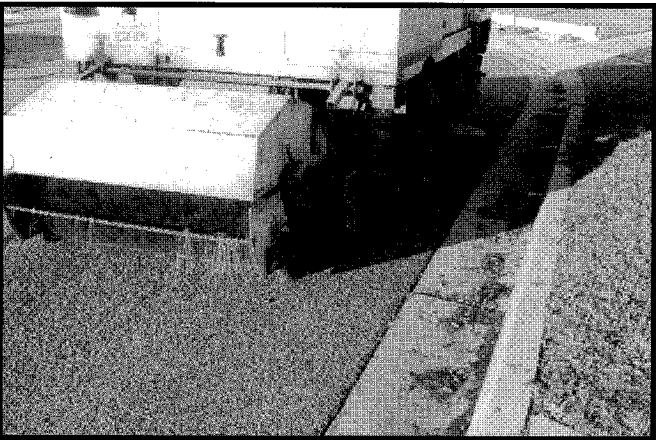
SLIDE 9



FILLING AND SEALING PAVEMENT SURFACE CRACKS

Materials successfully used for crack sealing include the following: Rapid-setting asphalt emulsion with fine cover aggregate, hot asphalt-rubber mixtures, and hot-paving asphalt with polypropylene or polyester fibers. The crack sealing should be completed several days prior to the application of slurry seal to allow the crack sealer to cure and harden.

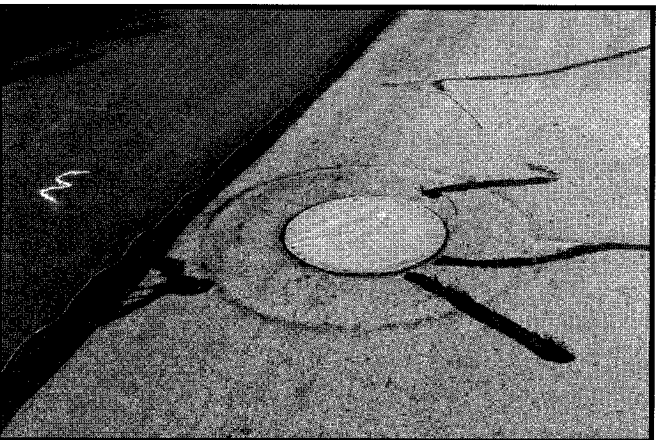
SLIDE 10



SWEEPING AND CLEANING THE STREETS

Sweeping the streets is an important process to clean the surface of dirt, dust, leaves and other contaminants. This promotes good adhesion between the paving substrate and slurry seal surfacing.

SLIDE 11

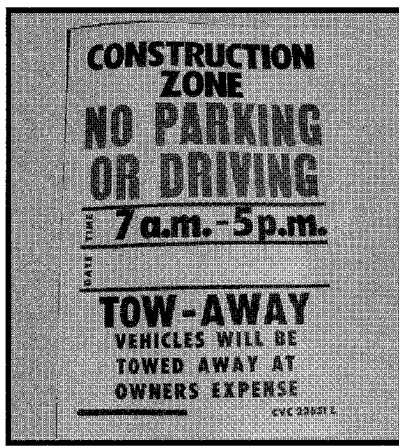


PROTECTION OF MANHOLE COVERS, UTILITY CONNECTIONS

Manhole covers and other utility connections are protected from the slurry by covering with either polyethylene film or roofing felt, secured with a spray adhesive.

The covering material is removed after the slurry seal has solidified, prior to opening to traffic.

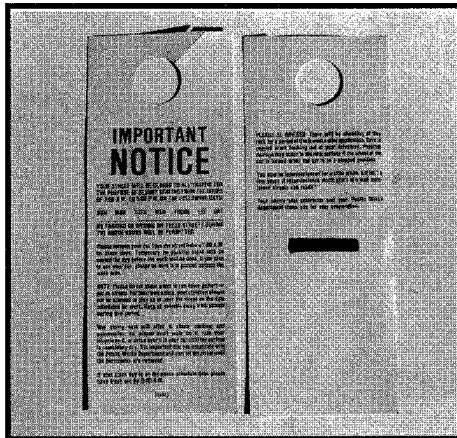
SLIDE 12



NO PARKING AND STREET CLOSURE NOTIFICATIONS

From one (1) to seven (7) days prior to slurry sealing, public notices are placed at a set interval along each side of the street.

SLIDE 13



PERSONAL NOTICE TO RESIDENTS

From one (1) to four (4) days prior to slurry sealing, personal notices are placed at each residence along the street. The notice contains the specific day and date of the slurry work. Prohibitions against allowing water to run into the gutters or onto the street and control of children and animals should also be included.

SLIDE 14



CLEANING AND INSPECTING THE SPREADER BOX

Each morning, prior to construction, the spreader box is inspected and recleaned to remove any dried slurry. This prevents drag marks caused by dried slurry clinging to rubber screeding surfaces.

Worn rubber side skirts or screeds can be replaced at this time.

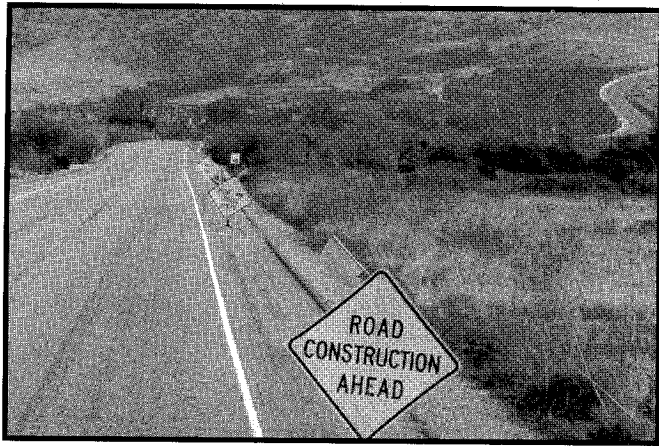
SLIDE 15



AGGREGATE, ASPHALT EMULSION, AND BARRICADE STOCKPILE AREA

A stockpile area of suitable size should be located as close as possible to the work area and transportation routes to accommodate incoming material deliveries.

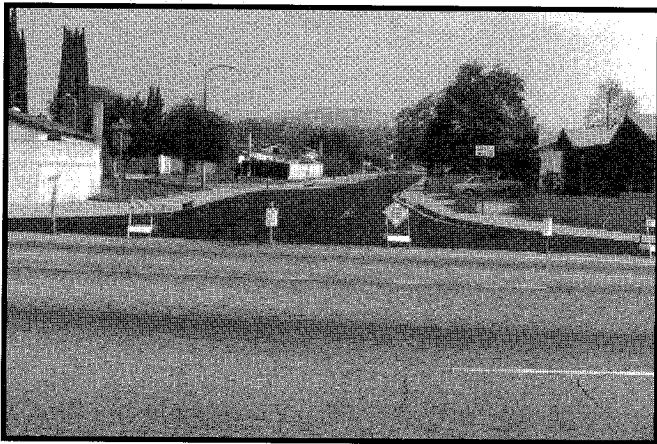
SLIDE 16



ROAD CONSTRUCTION SIGNS

Signs warning of road construction ahead should be placed at proper intervals in advance of the project location. This is necessary on rural roads or arterial streets where higher vehicular speeds are encountered.

SLIDE 17

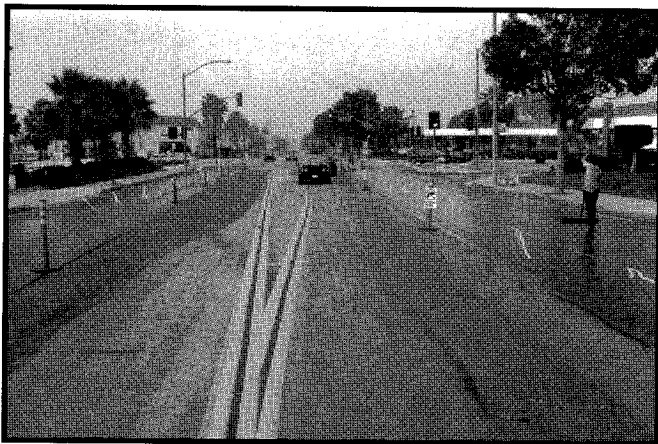


RESIDENTIAL STREET CLOSURE

Residential streets are typically closed completely to traffic for slurry sealing. This closure period varies widely, depending on climate conditions, from two (2) to four (4) hours.

Many specifications indicate that a "quick-set" slurry seal shall be capable of supporting some load within one (1) hour.

SLIDE 18

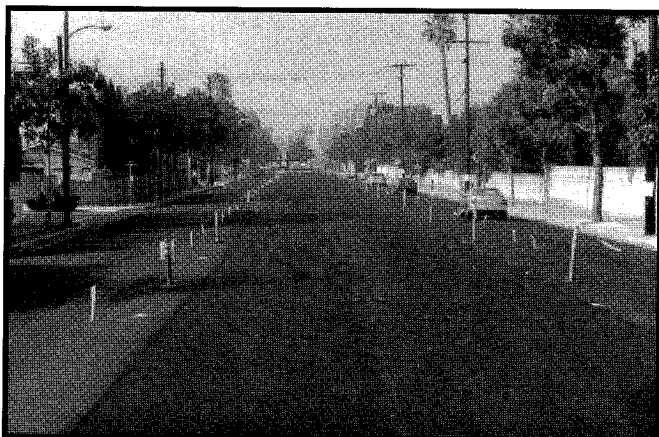


ARTERIAL STREET CLOSURE INITIAL PHASE

Traffic is usually allowed on arterial streets during construction. This is achieved by having traffic use the inside lanes while slurry is being applied to the outside lanes of the street.

Where catch basins are encountered, the slurry must jut out to avoid the concrete apron.

SLIDE 19



ARTERIAL STREET CLOSURE COMPLETION PHASE

In the final phase, traffic is rerouted to the outside lanes while slurry is being applied to the inside lanes.

This sequence of slurring the inside lanes last corrects the misalignment of the first passes where the slurry has jutted out around catch basins. The final results are visibly appealing, straight, longitudinal joints.



SPREADING SLURRY WITH THE HAND SQUEEGEE

Hand work is necessary at the end of slurried streets. A good straight line is made by placing a chalk line curb to curb. Then, #15 roofing paper is placed down so that the slurry runs slightly onto the roofing paper, resulting in a neat, straight line when the roofing paper is removed.

SLIDE 21



TEXTURING SLURRY WITH HAND SQUEEGEE WITH BURLAP DRAG

To match the finish texture of machine-laid slurry, the hand squeegee, with burlap drag, is pulled longitudinally over the area previously spread with the hand squeegee.

SLIDE 22

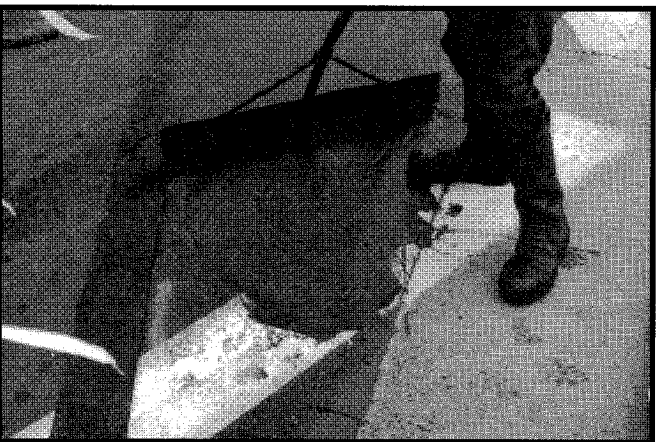


IMPROPER WORKMANSHIP AT THE END OF SLURRIED STREETS

It is incumbent on the slurry machine operator to provide the hand squeegeeman slurry in the proper quantity and consistency for them to complete their handwork satisfactorily.

This photo shows slurry that is being applied too thickly because too much material was left at the end of the pass. In addition, the consistency is not correct for proper hand squeegee application.

SLIDE 23



IMPROPER HAND SQUEEGEE PROCEDURE

Neat, clean, straight, properly textured hand squeegee work places high demand on this workman.

This photo shows the squeegeeman in an improper position to accomplish hand squeegeeing in this difficult area.

SLIDE 24



PLACING SLURRY AT THE CURB PASS

The driver is controlling the spreader box to place the slurry in a straight line, slightly overlapping the joint between the concrete gutter and street pavement.

The operator is controlling the quantity and consistency of the slurry mixture. The consistency is a result of several variables made up of the nature of the aggregate, asphalt emulsion, amount and type of chemical additive, as well as quantity of water.

SLIDE 25



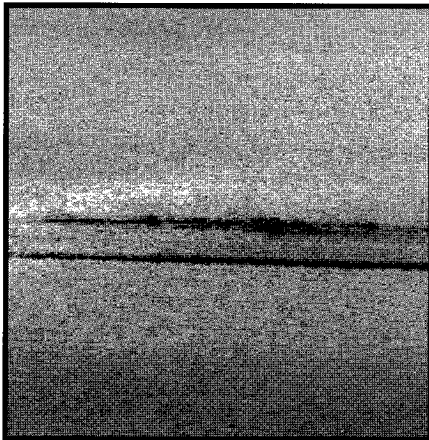
CONSISTENT, UNIFORM APPLICATION OF SLURRY

Slurry of the proper consistency does not run onto the concrete gutter and has no evidence of excessive free water on the surface.

A squeegeeman walks behind the spreader to watch for and remove any imperfections such as skips or drag marks.

The speed of the truck must be limited so that ripples are not introduced into the slurry surface adversely affecting ride characteristics.

SLIDE 26

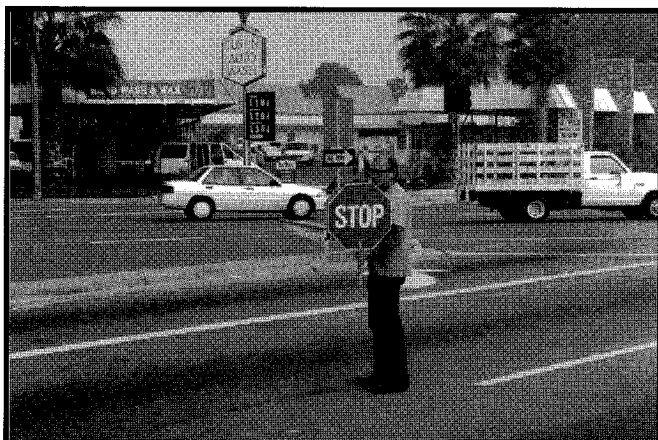


DRAG MARK AND IMPERFECT JOINT

Drag marks are caused by oversize aggregate. These oversize pieces of aggregate have entered the slurry mixture as contamination from the stockpile or aggregate that has come up from the substrate.

The squeegeeman following the machine must walk in the wet slurry and remove these marks quickly before the slurry begins to set.

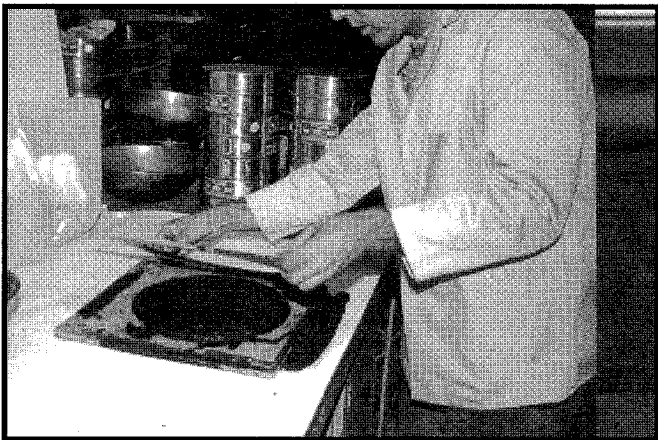
SLIDE 27



CONTROLLING TRAFFIC AT THE END OF A PASS

A flagman must stop the traffic at the street where the slurry pass is to be stopped. This allows the machine to slowly come to the end of the pass and turn around in the intersection.

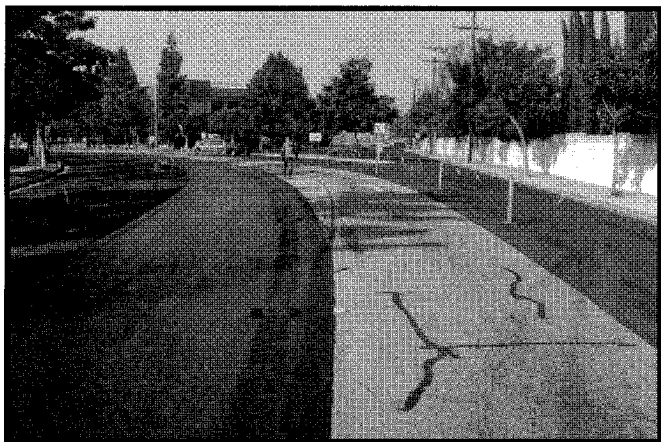
SLIDE 28



MIX DESIGN USING JOB MATERIALS

After the project is awarded, the contractor must have a laboratory mix design prepared. The mix design should recommend the optimum proportions of aggregate, asphalt emulsion and chemical additive to achieve the strength, wear and consistency requirements of the owner agency's construction specifications.

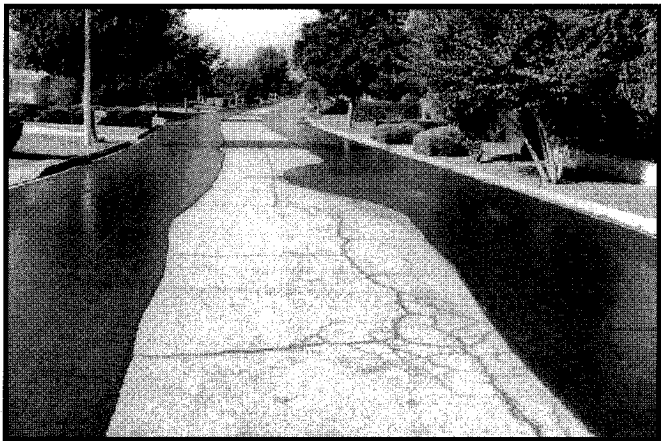
SLIDE 29



WELL-PREPARED STREET

This street is ready for the final pass of slurry. The cracks have been sealed with an asphalt-rubber crack sealer, and lane tabs have been installed on the centerlines to assist in restriping. Lane delineators with string and plastic ribbon are in place to control two-way traffic to the outside lanes.

SLIDE 30



STREET NEEDING ADDITIONAL PREPARATION

Cracks need to be sealed, pavement failures repaired, and low overhanging trees should be trimmed prior to slurry sealing.

SLIDE 31



TIRE DAMAGE ON UNCURED SLURRY SEAL

Even with the best notification, signing and traffic control, some drivers will cause tire damage to the uncured slurry. When this damage occurs in the final drying stage, repair is usually made by reapplying slurry to the affected area by machine.

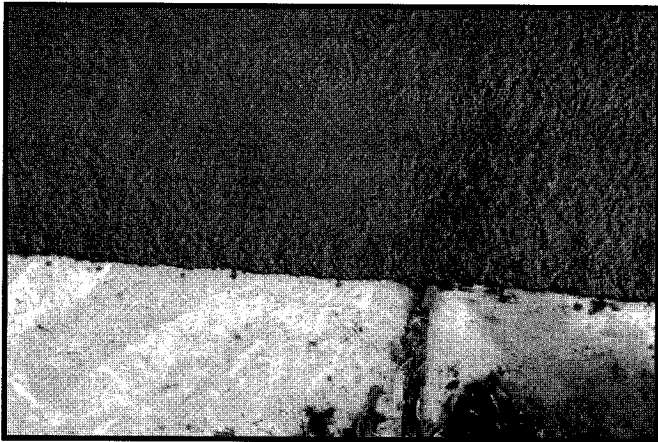
SLIDE 32



PAVEMENT SURFACE DETAIL BEFORE SEALING

The pavement surface and gutter line are in good condition with no vegetation in the joint. Slurry sealing at this point will greatly extend the life of the pavement.

SLIDE 33



PAVEMENT SURFACE DETAIL AFTER SEALING

A well-designed slurry has now been applied to this pavement. Note the uniform texture and slight overlap of the concrete-asphalt joint to prevent the intrusion of water. Slurry seal proportioned and applied as outlined in the standard specifications will have an expected life between five (5) and seven (7) years.

SLIDE 34



PAVEMENT SURFACE NEEDING ASPHALT PATCHING

This area should have been patched with hot mix asphalt prior to applying slurry.

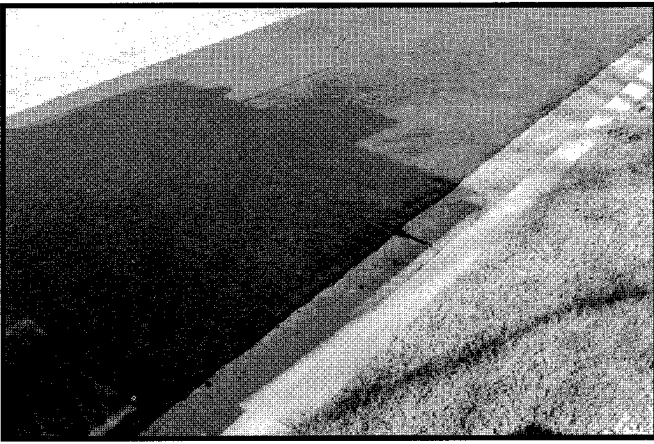
SLIDE 35



SLURRY OVER UNPATCHED PAVEMENT SURFACES

Type I and Type II Slurry Seal are designed to be placed in a thickness from 1/8" to 1/4". Depressions in the pavement substrate greater than 1/4" will reflect up to the finished surface.

SLIDE 36

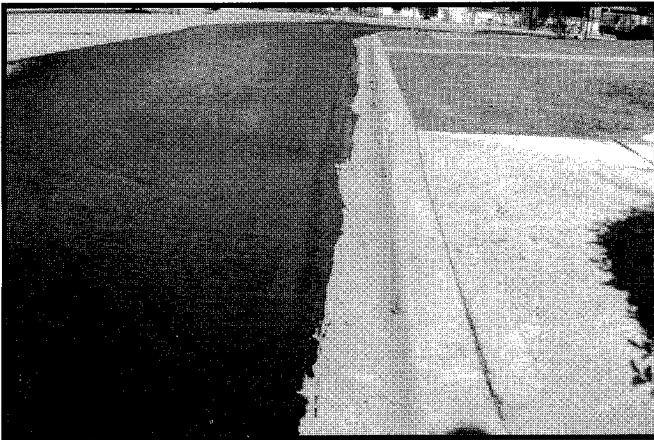


CHATTER AND RIPPLE MARKS

These surface imperfections are objectionable because they affect the quality of the ride.

Chatter and ripple marks are usually caused by excessive speed of the slurry truck.

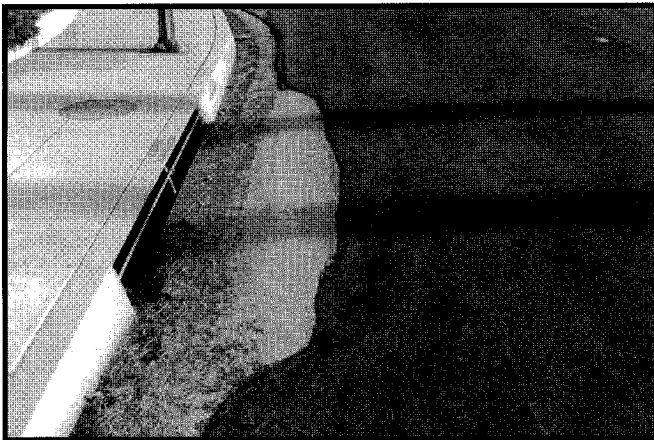
SLIDE 37



POOR WORKMANSHIP AT THE GUTTER LINE

The slurry seal should be placed in straight alignment with the concrete gutter. Irregular, ragged edges are caused by slurry that is too wet or poor workmanship in maintaining alignment by the truck driver or operator.

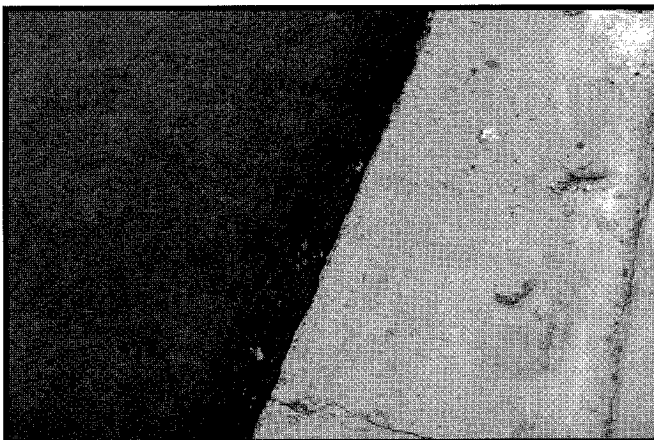
SLIDE 38



POOR WORKMANSHIP AT THE CATCH BASIN

The slurry seal should not round off the square edges of the apron approach to catch basins. This takes diligence on the part of the truck driver and operator to keep slurry off the concrete.

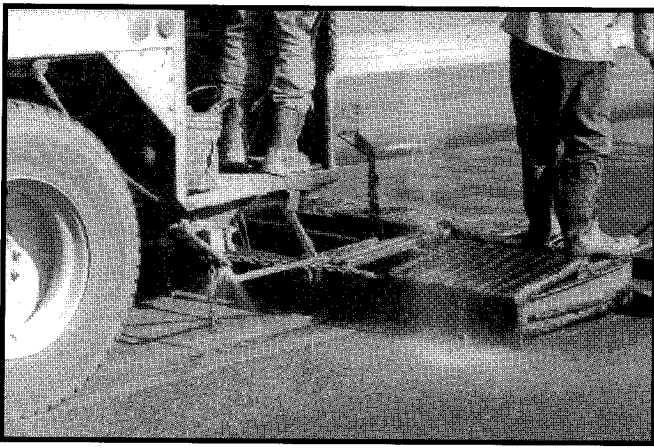
SLIDE 39



SEGREGATION OF THE SLURRY MIXTURE SHOULD BE AVOIDED

The operator is responsible for maintaining the fullness of the spreader box. Unless an adequate amount of slurry mixture is maintained at the back and sides of the spreader box, longitudinal voids called "skips" and segregation of the slurry mixture will result.

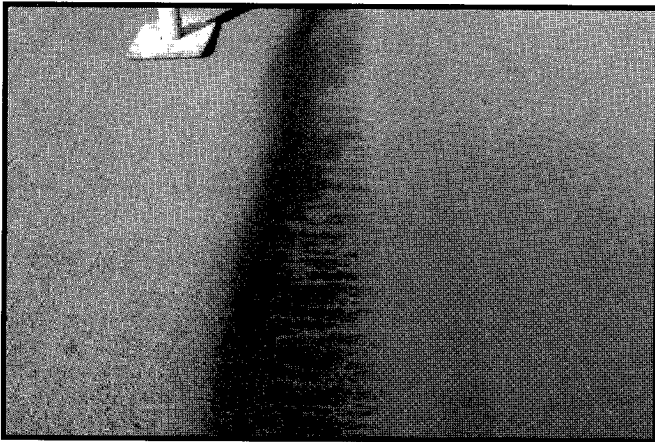
SLIDE 40



APPLYING TOO MUCH WATER TO THE JOINT LINE

In placing a pass of slurry adjacent to another, additional water should be added to the immediate area of the joint. This is to make the joint as neat and imperceptible as possible. The amount of water shown is excessive for this purpose.

SLIDE 41



RESULTS OF APPLYING TOO MUCH WATER TO THE JOINT

Excessive water on the slurry surface, when mixed with some emulsion, results in brownish color and longitudinal lines along the joint. This condition, although temporary, can be prevented by limiting the water.

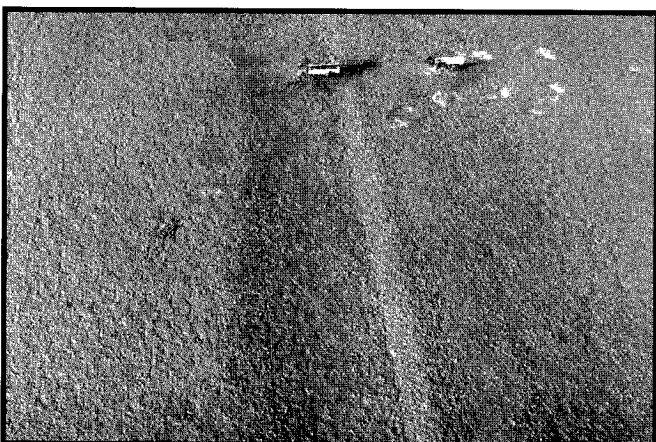
SLIDE 42



PROPER METHOD OF MAKING THE LONGITUDINAL JOINT

Water should be limited to just the amount necessary to create a buttery-fine aggregate mixture in the surface of the slurry material. This can be accomplished with spreader box alone or by the assistance of a hand squeegee if necessary.

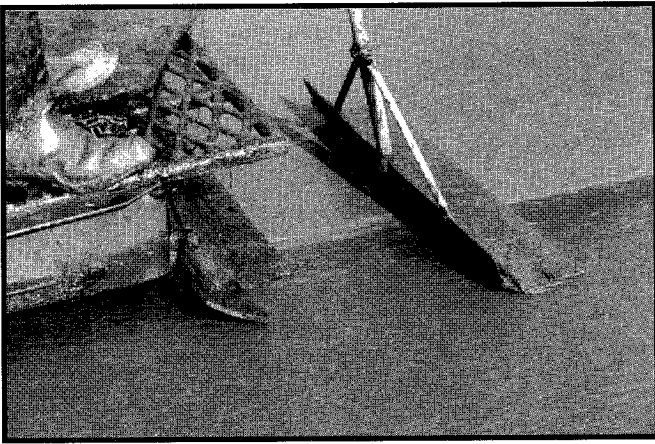
SLIDE 43



PROPERLY MADE LONGITUDINAL JOINT

The longitudinal joints, when properly made, will blend the aggregate texture and surface color so they are almost imperceptible.

SLIDE 44

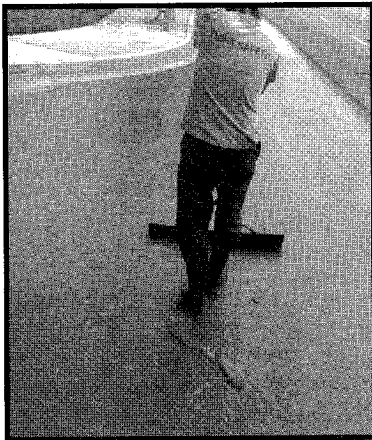


PROPER TEXTURING OF LONGITUDINAL JOINT

Burlap drags are sometimes used behind the spreader box to achieve the texture desired by the contractor or the owner agency.

If burlap is used behind the spreader box, the hand tool used for finishing should also have a burlap drag.

SLIDE 45



HAND FINISHING LONGITUDINAL JOINT

A hand squeegee operator must always attend the mixing and spreading operation. His function is to finish any areas of skips, surplus slurry, or other imperfections not accommodated by the spreader box.

SLIDE 46



ACCESS LANES FOR COMMERCIAL BUSINESS ESTABLISHMENTS

Sometimes it is necessary to provide access to business locations during the slurry operation. "Window" openings of uncoated pavement are left in the slurry mat at these locations. The "windows" are subsequently patched in with the slurry after the body of the street has been completed.

SLIDE 47



STOPPING THE SLURRY LAYDOWN OPERATION

Where it is necessary to stop the slurry operation, such as a "window", it is highly desirable to have the least amount of slurry in the spreader box when it is lifted from the pavement. It is the operator's responsibility to anticipate the amount of slurry in the spreader box at stopping points.

SLIDE 48



LAYING SLURRY OVER RAISED PAVEMENT MARKERS

Slurry can effectively be removed from raised pavement markers by accurately spraying them with a water-soap solution. This operation should commence immediately after placing the slurry. A Hudson type sprayer with the nozzle adjusted to a fine stream has proven to be a good implement for this purpose.

SLIDE 49

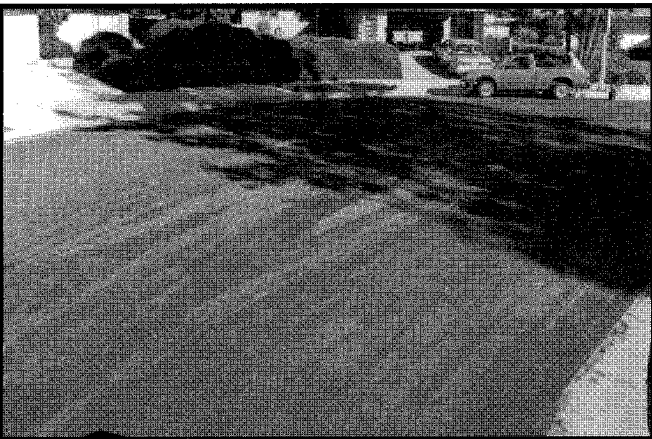


CHOOSE THE PROPER MIX DESIGN

Special consideration should be given to choosing the proper mix design for traffic conditions.

Arterial streets carrying high speed truck traffic place extreme lateral stresses on the pavement. A slurry mix design for these conditions should decidedly lean toward high-internal stability, and be characterized by lower asphalt content, large-aggregate size, and polymer-modified, high viscosity asphalt binder.

SLIDE 50



SPECIAL CARE SHOULD BE EXERCISED TO CONTROL THE AMOUNT OF WATER ADDED TO THE SLURRY MIXTURE

Excess water is probably the leading cause of poor performing slurry seal.

SLIDE 51

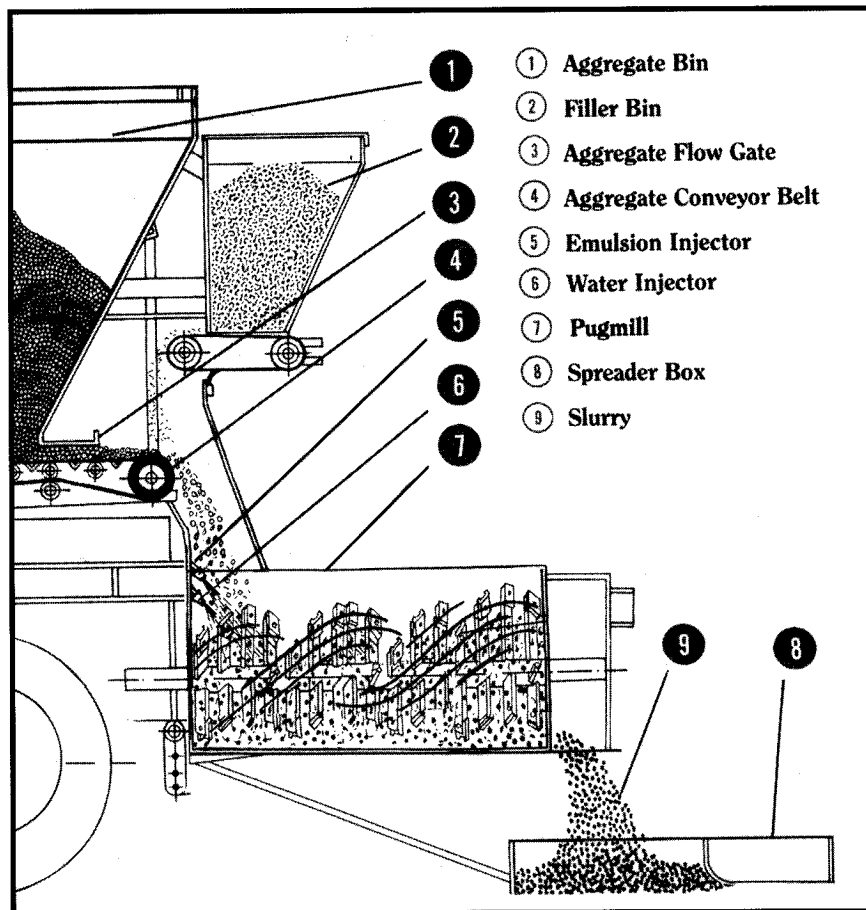


COMPLETED RESIDENTIAL STREET

The final job should exhibit the following features:

- Uniform, flat black color between the passes.
- Longitudinal joints in which the color and texture blend into the slurry mat.
- Straight edges of the slurry that overlap the joint between asphalt and concrete curb.
- Metal utility covers that have been protected from the slurry surfacing.

SLIDE 52



SLIDE 53

TYPES OF SLURRY

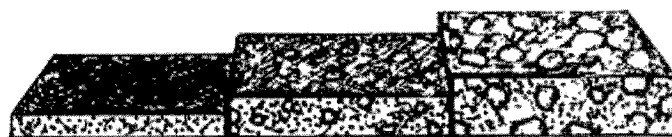
Emulsions of varying composition and setting times are mixed with any one of three grades of aggregates to create slurry seal mixes for specific purposes.

Aggregate types are I (fine), II (general), and III (coarse). Fine aggregate mixtures are used for maximum crack penetration and sealing in low-density/low-wear traffic areas. Type II aggregates are the most commonly used and are widely employed where moderate to heavy traffic is found. They seal, correct moderate to severe ravelling, oxidation and loss of matrix, and improve skid resistance. Type II corrects severe surface conditions - preventing hydroplaning and providing skid resistance under very heavy traffic loads.

A slurry seal for nearly any need or condition can be custom designed to satisfy the most difficult requirements.



AGGREGATE GRADATION



TYPE I
(1/8" X 200)

TYPE II
(1/4" X 200)

TYPE III
(3/8" X 200)

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Recommended Performance Guidelines for Emulsified Asphalt Slurry Seal Surfaces (A105)	\$1.00	\$3.00	_____	_____
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ISSA Design Technical Bulletin	\$30.00	\$80.00	_____	_____
An Intro to Slurry Seal & Micro-Surfacing Slides with script	\$100.00	N/A	_____	_____
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RESIDENTIAL STREETS

SLIDE 54

Slurry seal provides excellent surfacing to seal and fill the voids in eroded, coarse-textured pavements.



AIRFIELD RUNWAYS AND TAXIWAYS

SLIDE 55

Slurry seal is extensively used for airport surfacing. The uniform anti-skid surface is excellent for containing loose-raveling aggregate from the substrate, which can cause damage to jet engines.



This publication is produced and distributed worldwide by the International Slurry Surfacing Association (ISSA). ISSA is an international non-profit organization composed of individuals, corporations, and governmental agencies who provide the industry with machinery, materials, and services. The objectives of ISSA include:

- Provide technical data for monitoring and upgrading asphalt slurry systems (slurry seal and Micro-Surfacing) products;
- Advocate and encourage public and private interest in the use of asphalt slurry systems as efficient, effective, cost-saving, and safe additions to road maintenance programs;
- Encourage and promote ethical quality construction practices by all members of this association within the industry; and
- Aid all members of the association in furthering the success of asphalt slurry systems.

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